The Imaging and Relationship Between Adipose Tissue, Obesity, and the Brain

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What is Adipose Tissue?:

- Adipose tissue is our body fat, and is made of **adipocytes.**
- It's purpose is to insulate our bodies and act as protection.
- They are responsible for storage and release of energy, and the communication with other organs through hormones.
- Adipose tissue communicates to different organs of the body through hormones and motor signals from the central nervous system.
- When too much adipose tissue starts to accumulate in the body due to obesity, it can:
  - interupt communications with the brain
  - cause neurological damage.

Obesity Effects:

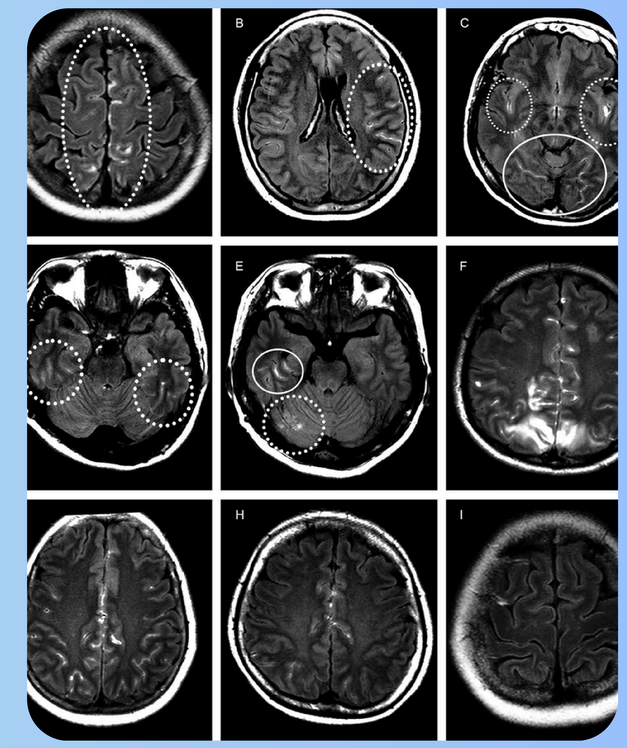
- Obesity is the over accumulation of adipose tissue and a BMI that it greater than or equal to 30.
  - A BMI greater than or equal to 40 would be considered morbidly obese.
- In obese individuals there is hyperplasia and hypertrophy of adipocytes.
- Rapid growth of adipocytes can cause hormone misregulation.
  - This can cause adipocyte-to-brain miscommunications and interruptions.
- A process called **neuroinflammtion** then takes place when there are miscommunications.

Neuroinflammation:

- Neuroinflammation is the inflammatory response of the central nervous system.
- When the brain is inflamed for a prolonged period, its **blood-brain-barrier** will start to weaken.
  - The blood-brain-barrier is a layer of cells that protect the inside of the brain's blood vessels.
- Proinflammatory **cytokines** are triggered when there is neuroinflammation in the brain. They act to control inflammation.
- An obese individual is at risk of chronic brain nueroinflammation because of hormone and neural disruptions from over expanding adipocytes.
- They will have a weak blood-brain-barrier where the cytokines can breach, and cause more excessive inflammatory responses.
  - Consequences of this are **neurogenerative disorders**, such as dementia.

Sources:

- https://doi.org/10.53347/rID-18340
- https://www.science.org/doi/10.1126/science.ade2132
- https://www.cdc.gov/nchs/products/databriefs/db508.htm
- https://doi.org/10.3390/metabo13010086
- image: researchgate.net



Imaging with MRI:

- Viewing neuroinflammation in the brain caused by obesity can be done with MRI.
- We can view the blood-brain-barrier's permeability through the use of gadolinium contrast media.
- A T1 weighted MRI setting with this contrast makes areas of fluid, edema, and damage to the brain tissue **brighter** on the image.
  - In the image above, these breaches with the contrast are circled.
- From here, a course of treatment will be decided.